than 8 cm., or if it falls more than 11 cm. With increasing size of drop all of these distances increase. Thus the lower limit of the range of sounding which is marked *A* on the figure is about 7.0 cm. for a drop which has a mass of 45 mg., but is between 7.7 cm. and 7.8 cm. for a drop which has a mass of 49 mg.

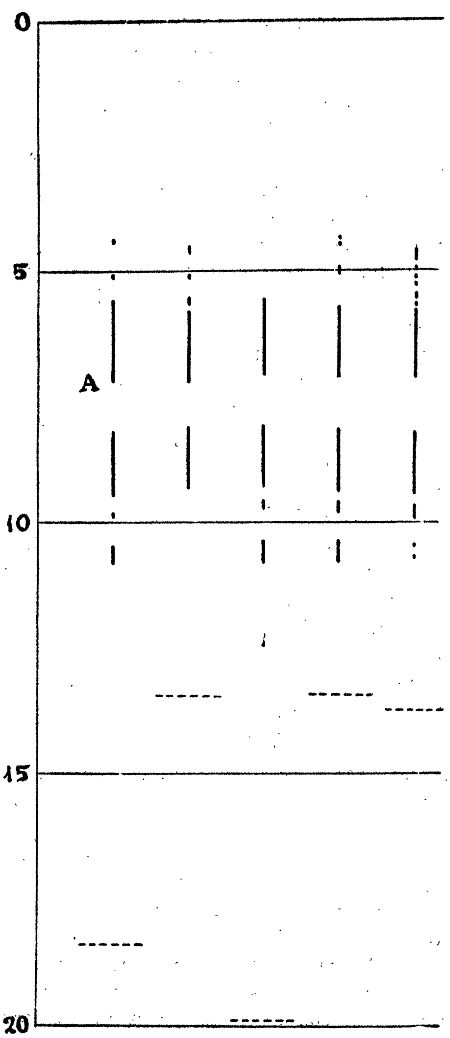

Fig. 1.

The depth of the water into which the drop falls makes no difference so long as this depth exceeds about three centimeters. The horizontal distance from the boundary of the water surface to the point at which the drop strikes makes no difference so long as this distance is more than about a centimeter. The depth of the water surface below the top of the containing vessel appears to be without effect.

Instead of the characteristic sharp click of the drop there was occasionally a softer, duller sound, and when this soft sound occurred the drop often left a bubble at the point where it had struck. In the case of the click no bubble was usually left.

I have no explanation to suggest for this series of sounds. If they depended on the shape of the drop when it struck the water we should not expect an abrupt boundary between the regions of sounding and the regions of silence, and we should expect the series of regions to repeat at distances proportional to the squares of the successive integers.

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THE CRYSTAL STRUCTURE OF ICE

X-ray photographs of ice were taken to determine its crystal structure following the method used by A. W. Hull.[1] The lines on the film correspond to those of the hexagonal system. They show that ice has a lattice which is built up of two sets of right, triangular prisms interpenetrating one another in the following way. Consider the plane containing the bases of one of the sets of prisms. The molecules lie at the vertices of equilateral triangles of side 4.52 Ångstroms. At a distance of 3.66 Ångstroms above this plane lies the plane containing the bases of the second set of prisms. Here the molecules also lie at the vertices of equilateral triangles equal to those of the first set, but each molecule is situated directly above the center of one of the lower triangles. The other molecules of the crystal will lie directly above the molecules of the two planes just described at intervals of 7.32 Ångstroms. The above values give an axial ratio of 1.62 in good agreement with the crystallographer's value of 1.617.[2] From

1 *Phys. Rev.*, 9, 85, January, 1917.

2 Gmelin Kraut, "Handbuch der Anorganischen Chemie," Heidelberg, Vol. I., 1, p. 107, 1907.

these data the number of molecules at each point has been calculated to be two.

This means that the molecule of ice must be of the form $(H_2O)_2$ or H_4O_2. The full data and calculations will be published in the *Physical Review*.

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August 20, 1920

THE AMERICAN CHEMICAL SOCIETY. VIII

RUBBER DIVISION

W. K. Lewis, *chairman*

Arnold H. Smith, *secretary*

Discussion of report of committee on "Physical Testing."

A direct method for the determination of rubber hydrocarbon in raw and vulcanized rubber: W. K. LEWIS and W. H. MCADAMS. It has been shown by a volumetric method involving a double titration that the bromine consumption, corrected for the observed substitution is a true measure of the actual amount of pure rubber hydrocarbon known to be present. Although the amount of substitution increases with the length of the bromination period, the addition corresponds quantitatively to the actual amount of pure rubber hydrocarbon present when the bromination time is from two to four hours. Experimental data is given to show that the actual per cent. of $(C_{10}H_{16})n$ in vulcanized soft rubber can be determined by a volumetric bromination method herein described, involving a second titration to correct for the substitution which accompanies the particular analysis by titrating in dim daylight, this substitution correction can be made very small.

The value of shoddy in mechanical rubber goods: J. M. BIERER. A chart was presented which gave the cost relations between scrap rubber and reclaimed rubber. The value of this reclaimed rubber was evaluated on a basis of tensile strength and compared to a corresponding priced new rubber. A line of demarkation through the center of the chart showed where it was more economical to use new rubber or reclaimed rubber.

The recovery of volatile solvents: W. K. LEWIS. Solvents used in the rubber industry may be recovered by the use of any method such as absorption, compression or cooling. Ordinarily in the rubber industry the solvent vapor is diluted with a large quantity of air and in this case the absorption method is best. When such conditions are present so that one has concentrated vapors a compression method becomes available. Benzol used in pregnating cord tire fabric may be recovered with an efficiency of 90 per cent. by enclosing the impregnating apparatus and passing the vapors through an absorption tower. The danger of fire or explosion may be eliminated by passing flue gas into the apparatus.

On the determination of true free and true combined sulphur in vulcanizing rubber: W. J. KELLY. At present sulphur is considered as free and combined. Acetone soluble sulphur may be partly combined with resins, etc., as may also the sulphur insoluble in acetone, heretofore considered as combined with rubber. The total acetone extract is soluble in EtOH, but if EtOH saturated with sulphur is employed, none of the truly free sulphur will dissolve and hence can be separated from the remainder of the extract. Results show about 0.4 per cent. sulphur combined with resins, etc. About 85 per cent. of Heva resins are saponifiable and hence any resinous sulphur compounds insoluble in acetone may be soluble in alc. KOH. Acetone extracted sample is boiled 8 hours in 5 per cent. alc. KOH and about 0.26–0.30 per cent. sulphur extracted. Successive extractions do not increase this. Hence, the rubber is not being decomposed. These results are on pure gum and sulphur stocks and will be extended to compounded stocks later.

Analytical determination of the coefficient of vulcanization: S. W. EPSTEIN.

Small amounts of magnesia and certain organic substances as accelerators: G. D. KRATZ and A. H. FLOWER. The activity of small amounts of extra light magnesia as an accelerator was compared with the effect of similar amounts of certain organic accelerators. The load required to effect a given extension was found to be a fair measure of the rate of cure of the mixture which contained magnesia; however, this was not true for the mixtures which contained the organic accelerators. The accelerating activity of magnesia in small amount was found to be of secondary or contributory, character, acting in conjunction with, or in response to, certain extraneous substances, probably nitrogeneous, present in the rubber. The amount and nature of these extraneous substances was found to limit the activity of magnesia as an accelerator.